LOOSE STITCHING MECHANISMS FOR SINGLE NEEDLE LOCK STITCH MACHINES

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This invention relates to lock stitch sewing machines and, more particularly, to mechanism in a lock stitch sewing machine for producing loose stitches.

It is an object of this invention to provide a mechanism for producing loose lock stitches, which mechanism is completely contained within the normal outlines of conventional sewing machine parts so as not to interfere in any way with the normal progress of work fabrics through the machine nor with the manipulation of the work fabrics during stitching.

It is a further object of this invention to provide a loose stitch producing mechanism which influences only a completely contained loose stitch and does not disturb or influence the normal disposition of the sewing threads during the actual stitch forming processes.

It is also an object of this invention to provide a loose stitch producing mechanism which may be applied readily to an existing lock stitch sewing machine.

With the above and other objects and advantages in view as will hereinafter appear, this invention comprises the devices, combinations and arrangements of parts hereinafter described and illustrated in the accompanying drawings of a preferred embodiment in which:

Fig. 1 is a vertical cross sectional view of the bed portion of a lock stitch sewing machine having a loose stitch producing mechanism of this invention applied thereto.

Fig. 2 represents a top plan view of a portion of the bed of the sewing machine of Fig. 1.

Fig. 3 represents an enlarged parts sectional view of the stitching point of the sewing machine taken substantially along line 3—3 of Fig. 1.

Fig. 4 represents a cross sectional view of the driving cam for the slack producing finger taken substantially along line 4—4 of Fig. 1.

Figs. 5 and 6 represent enlarged fragmentary cross sectional views of the stitching point taken transversely of the sewing machine frame and illustrating in Fig. 5 the position of parts at loop seizure and in Fig. 6 the position of parts at stitch setting.

Figs. 5A and 6A represent enlarged fragmentary cross sectional views of the stitching point taken longitudinally of the sewing machine frame and illustrating the position of parts corresponding to Figs. 5 and 6, respectively.

Referring to the drawings, this invention is illustrated as applied to a sewing machine of the type having a flat work supporting bed 11 from which rises a bracket arm 12 a portion of which is illustrated in Figs. 1 and 2. A needle bar 13 carrying a needle 14 is journaled for endwise reciprocation in the bracket arm and a presser bar 15 carrying a presser foot 16 is carried in the bracket arm for endwise motion and is spring biased downwardly to bear against a throat plate 17 carried on the work supporting bed.

Driven from any conventional needle bar actuating shaft (not shown) in the bracket arm by means of a timing belt 18 is a bed shaft 19 journaled beneath the work supporting bed. The bed shaft carries a feed driving eccentric 20 and a feed lift eccentric 21 each operably connected in a conventional manner to a feed dog 22 which operates upwardly through slots 23 in the throat plate to feed a work fabric across the work supporting bed.

The bed shaft 19 extends through a bushing 24 into an oil reservoir 25 formed beneath the bed. An internal gear 26 fast on the bed shaft within the oil reservoir is provided with an enlarged hub 27 providing a barrel cam formed with a peripheral cam groove 28. The cam groove may, if desired, be formed as a part of a separate cam member brazed or fixed in any other known manner to the bed shaft for rotation with the internal gear 26.

A hook shaft 29 journaled in a bushing 30 and extending into the oil reservoir 25 has a pinion 31 fixed thereon and the pinion is disposed in mesh with the internal gear 26. At the outboard extremity beneath the needle, the hook shaft carries a rotary loop-taker 32. As illustrated in the drawings, the loop-taker is of the type referred to in the art as a "rotary hook," however, this invention is applicable to any known form of lower lock stitch forming instrumentalties. In Fig. 5, only the loop seizing back 33 of the loop-taker 31 is illustrated in an interest of clarity. It will be understood that the loop-taker 32 in the embodiment illustrated in the drawings partakes of two revolutions for each reciprocation of the needle.

The upper work supporting surface 34 of the throat plate is formed with a needle aperture 36 of which the upper portion is formed as illustrated in Figs. 3, 5 and 6, with a depression 35 of which the end walls in the direction of feed are flared or inclined outwardly. The needle 14, in cooperating with the loop-taker in the formation of stitches, reciprocates endwise in a path which extends through the needle aperture 36. It will be understood that although the inclined depression 35 is preferred, the needle aperture may be elongated in the direction of feed thereby eliminating the depression 35 in favor of a plain elongated needle aperture.

At the right hand side of the needle aperture 36 in Figs. 1 and 2, i.e., that side nearest the bracket arm 12, the throat plate is formed with slot 37 open beneath the throat plate and merging into the depression 35 of the needle aperture. The slot 37 may be made shallow and formed completely in the throat plate, or as illustrated in Figs. 2 and 5A of the drawing, the slot may be cut completely through the throat plate and closed at the top by a thin cover plate 38 secured to the throat plate by screws 39. Deposited in the slot 37 is a finger 40 which extends transversely of the line of feed, as determined by the feed dog 22, and behind the needle aperture 36 considered in the direction of feed, as indicated by the arrow in Fig. 6. The finger 40 is offset upwardly from a base portion 41 which is secured as by a screw 42 to a slide bar 43 which is longitudinally slidable in a slidebar 44 formed lengthwise in the work supporting bed 11. The slide bar 43 is slabled angularly at 45 and is fitted in the slabled portion with a cam follower pin 46 secured to the slide bar by means of a nut 47 and disposed to track the cam groove 48. A cover plate 46 secured by screws 49 over the slidebar 44 constrains the slide bar in the slidebar. The cover plate 48 is formed with an aperture 50 exposing the nut 47. A cover block 51 is secured by screws 52 over the aperture 50 in the cover plate 47.

The cover plates 48, 49 and 50 completely enclose the loose stitch mechanism to prevent lint or other foreign material from becoming lodged therein and to prevent any interference of the mechanism with the work fabrics being stitched.

The cam groove 48 is formed with two axially offset portions 29" and 29". The offset portion 29" extends for approximately 270° of the periphery of the cam and the portion 29° extends for approximately 90° of the periphery. The slide bar will thus be oscillated lengthwise of the work supporting bed, or in other words, perpendicular to the line of feed of the sewing machine, in
union with the reciprocation of the needle. Preferably, the cam 27 is timed such that the finger 40 under the influence of the offset portion 28' of the cam groove will be shifted toward the free end of the work supporting bed and into a position crossing the line of stitch formation behind the needle aperture, as illustrated in Figs. 1, 6 and 6A, during the interval that the needle is raised out of the work. Similarly, the shorter interval during which finger 40 is retracted to one side of the line of stitch formation by the offset portion 28" of the cam groove preferably coincides with that interval during which the needle is penetrating the work, as illustrated in Figs. 5 and 6.

The operation of this invention is best described by initial reference to Fig. 5 of the drawings which illustrates the position of the parts at the stitching point of a sewing machine at that point in a cycle of stitch formation in which a loop of the needle thread n is being seized by the loop-taker. The feed dog 22, having completed its active stroke, is partaking of its return or idle motion and the bobbin thread, indicated at b, extends from a loop between the feed dogs in the work along the inclined endwall of the depression 35 in the throat plate and thence through the needle aperture 36 and to the bobbin.

The needle thread n presented by the needle 14 through the work and the throat plate will extend vertically while the needle remains in the work. Thus, owing to the novel formation of the depression 35 in the throat plate, a triangle is formed between the bobbin thread and the needle thread leading from the previous stitch.

As illustrated in Figs. 6 and 6A, the finger 40 is shifted endwise into the triangle defined by the bobbin and needle threads leading from the preceding stitch. After the bobbin thread has been concatenated with the needle thread and while the stitch is being set into the work during the upstroke of the needle, the bobbin thread will be detained about the finger 40 as illustrated in Figs. 6 and 6A. On the succeeding downstroke of the needle, the finger 40 will be withdrawn from the stitch releasing the bobbin thread which will then have that amount of slack or looseness measured by the length required to extend about the finger 40.

Since the finger 40 is moved out of the line of stitch formation, and consequently, out of engagement with the sewing threads during the work penetrating portion of the needle reciprocation, as illustrated in Figs. 5 and 5A, the finger 40 cannot adversely affect the stitch forming process. The finger 40 is not moved into position to be engaged by the sewing threads until after concatenation of the sewing threads has occurred. The finger 40 thus influences only the stitch setting portion of a stitch forming cycle and, therefore, cannot have any adverse effect upon the thread handling characteristics of any lock stitch sewing machine to which this invention is applied.

Having thus set forth the nature of the invention, what I claim herein is:

1. In a lock stitch sewing machine having a frame, a work supporting throat plate carried on said frame and formed with a needle aperture and feed dog slots, a needle journaled in said frame for endwise reciprocation through said needle aperture, and a feed dog operable through said slots to feed a work fabric in a predetermined direction, mechanism for producing loose stitches comprising a throat plate carried on said frame and having a working support top surface, the work supporting surface of said throat plate being formed with a needle aperture, a lengthwise elongate finger having a free extremity disposed in said throat plate aperture and extending lengthwise substantially perpendicular to said direction of feed and widthwise beyond the path of reciprocation of said needle considered in the direction of feed, and means for shifting the free extremity of said finger in a direction parallel to the length of said finger into and out of a position across a line extending through the path of reciprocation of said needle and in the direction of feed.

2. A device as set forth in claim 2 in which said throat plate is formed at one side with a passageway extending perpendicular to said line through the path of reciprocation of said needle and in the direction of feed merging into said needle aperture, a lengthwise elongate finger having a free extremity disposed in said passageway, and the means for shifting the free extremity of said finger carried within said sewing machine frame.

3. A lock stitch sewing machine having a frame including a bed, a work penetrating needle journaled for endwise reciprocation in said frame, a work supporting throat plate carried on said frame and disposed to cooperate with said needle in the formation of lock stitches, a bed shaft journaled in said bed, means for rotating said bed shaft once for each reciprocation of said needle, an operative connection between said bed shaft and said loop-taker, and work feeding mechanism operable to advance work fabric in a predetermined direction across said frame, mechanism for producing loose stitches comprising a throat plate carried on said bed and having a work supporting top surface, said top surface of said throat plate being formed with a depression and said throat plate being formed with a needle aperture at the bottom of said depression and with a passageway disposed at one side of said needle aperture extending perpendicular to the line through the path of reciprocation of said needle and in the direction of feed and merging into said depression, a lengthwise elongate finger extending through said passageway and having a free extremity disposed in said throat plate depression and extending lengthwise substantially perpendicular to said direction of feed and widthwise beyond said needle aperture considered in the direction of feed, and means for shifting the free extremity of said finger in a direction parallel to the length of said finger into and out of a position across a line extending through said needle aperture and in the direction of feed, said means including a cam fast on said loop-taker drive shaft, a cam follower tracking said cam, and means operatively connecting said cam follower with said finger.

4. A sewing machine as set forth in claim 4 in which said bed shaft carries a loop-taker driving gear, a loop-taker drive shaft journaled in said bed, a pinion fast on said loop-taker drive shaft and in mesh with said bed shaft gear, and said cam being fast on said loop-taker driving gear.

5. A sewing machine as set forth in claim 4 in which said cam is a barrel cam formed with a peripheral cam groove timed to shift said finger into said position across a line extending through said needle aperture and in the direction of feed while the needle is out of the work, and out of said position during work penetration by the needle.

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